

METHOD AND SYSTEM FOR DIVERTING TELECOMMUNICATIONS  
CONNECTIONS

CLAIM FOR PRIORITY

This application claims priority to International Application No. PCT/DE00/02939 which was published in the German language on March 8, 2001.

TECHNICAL FIELD OF INVENTION

The present invention relates to a method and a system for diverting telecommunications connections.

BACKGROUND OF THE INVENTION

Providers of public telecommunications networks offer a range of supplementary services in addition to the usual basic services - which typically include a rule, the setting up of telecommunications connections and the transmission of useful data for the communication. The present invention makes use of the service of call deflection that permits a user under various conditions to divert incoming connections to other terminals, for example to automatic spoken announcements, to an operator or to another terminal at which the user can temporarily be reached.

"Teleworkers" or "Telecommuters", for example, also avail themselves of such call deflection. These are to be understood to include staff members of a company who, in addition to their company workstation, also work from home from time to time and are, in particular, to be contactable there by phone. An insurance agent is an example of such a teleworker. If the latter activates the call deflection, telephone calls arriving at his company workstation are deflected automatically to his home terminal.

However, insurance agents in particular carry out the

majority or even their entire work from home (possibly also only on specific days of the week), and so they use their actual company terminal seldom to never. Maintaining a plurality of such terminals that are, in addition, only seldom used constitutes, however, a cost factor not to be neglected.

US 5,905,776 also discloses a system and a method that permits users to make use of one from among a number of different telecommunications stations at different locations, while the apparent location of the user remains fixed. Coordination modules of a private branch exchange (PBX) establish a peer-to-peer communication with station-based coordinate modules in order to permit automatic connection to a terminal at which the individual user is located while he leaves the apparent location of the fixed, specific user terminal of the branch exchange. In this case, the coordination modules are integrated as "line cards" in the private branch exchange (PBX), or connected thereto.

In one embodiment, the compatibility of the terminals enables a user to work from a terminal that is arranged near him at home, while the apparent location of the user for any calling party is a terminal assigned to the user and located in the office.

US 5,889,845 discloses a device and a method for permitting a connected user a virtual presence in a company office and being essentially able to behave as if this user were physically present in the company office.

In one embodiment, a virtual presence server instructs the private branch exchange (PBX) to forward all calls automatically to the connected user. In accordance with this prior art, the connected user handles outgoing telephone calls, fax transmissions, data transmissions and E-mail and implements his Internet access as if said connected user were physically present in the

company office.

In a further embodiment, the virtual presence server and/or the user communications equipment carries out a call forwarding operation in order to forward telephone calls that are directed to the user's dwelling to the virtual presence server of the company office.

#### SUMMARY OF THE INVENTION

It is therefore an object of the invention to specify a method for diverting telecommunications connections that permits a flexible participation of a large number of persons and of which the available telecommunications terminals and lines are used effectively.

According to another embodiment of the invention, a specific quantity of line identifications that are provided for the diverting method are made available initially in this case. During the initiation of the call deflection to a terminal (for example to the home terminal of a teleworker), an as yet unoccupied line identification of the line identifications made available is then allocated. It is possible in this way to avoid communications terminals that are used only insufficiently in a company, since the use of the single line identification by a plurality of persons (only one person a specific instant in each case, of course) (sharing) is permitted. Since the setting up of telecommunications connections is performed under computer control in the switching offices, the method is easy to accomplish by supplementing the control software.

The information required for the method (which line identifications are available and are not yet occupied, to which second terminal should a telecommunications connection directed to an allocated line identifications be diverted) is preferably stored in the public switching office belonging to these line

identifications (a plurality of switching offices also being possible). After the allocation of a line identification, the diversion of the telecommunications connection is then performed automatically in this public switching office. In relation to these line identifications, there is preferably not any need at all in this case for the existence of real terminal connections or even terminal equipment (telephones or fax machines).

In one alternative embodiment of the invention, for example, line identifications of "virtual terminal connections" are used such that a connection is successfully set up when such a virtual terminal connection is assigned a real second terminal connection to which the connection is diverted. However, if corresponding terminal equipment also exists in relation to the line identifications, then this equipment can also be used as normal company terminals when not occupied.

The line identifications available are preferably main lines such that the management of the method according to the invention can be performed in the public switching offices. However, if the teleworker is employed in a relatively large company, it is normal there for the line identifications or the corresponding terminals at the company workstations to be combined in a private branch exchange (PBX). A portion of the branch exchange lines can be reserved for call deflection. However, the data required for the deflection continue to be stored in the public switching office of the private branch exchange, since a diversion can then already be performed there, and a diverted telecommunications connection does not impose a load on the lines between the switching office and the private branch exchange. However, in order to ensure that a connection from another internal terminal of the branch exchange is also correctly diverted to a home terminal, the private branch exchange stores at least the information as to whether a line

identification is allocated in the course of the diverting method. If this is the case, calls internal to the branch exchange are automatically forwarded to the public switching office and deflected from there to the home terminal. Furthermore, an exchange of information between the public switching office and the private branch exchange is required to integrate branch exchange terminals in the method according to the invention.

For approximately 15 years, for example in the case of ISDN connections and of analog connections, it has been possible to find out the calling number of an interlocutor. In the case of ISDN connections, they are transmitted in the D-channel, in parallel with the useful data in the B-channel that are used for the communication. Information data that reproduce a line identification are evaluated and displayed by an appropriately designed telecommunications apparatus. Consequently, if while at work the teleworker calls a customer from his house, it will be possible for the latter to find out the private number of the teleworker. The customer would then be able to call the teleworker at home even in periods when the latter is not even working, and could disturb the latter in his leisure time.

Consequently, when a telecommunications connection is being set up from the second telecommunications terminal (that is to say, for example, from the home terminal of the teleworker) to a third telecommunications terminal (for example the telecommunications terminal of a customer), the information data including the line identification data are modified in such a way that, instead of the line identification of the second telecommunications terminal, they produce the first line identification obtained at the initiation (which then corresponds to the line identification of a company terminal). Consequently, it is fundamentally a company number, and not the private number, that is displayed during business telephone calls in the case of the method

according to the invention. From the point of view of the customer, the latter therefore calls his insurance representative at the latter's company workstation and/or is called up from the representative's company workstation. It is possible to ensure in this way (in conformity with labor law, for example, laws in Germany) that the teleworker cannot be disturbed during his leisure time, since business telephone calls are deflected to him at home when he has requested the call deflection. The data required for this purpose (first line identification and home terminal) are stored in the public switching office of the home terminal and when a connection is being set up the information data are also already modified there. Since it is difficult to rule out that different company line identifications can be allocated in each case for a teleworker when there is a repeated request for call deflection, it can be provided that the information data including the line identification data are modified in such a way that they reproduce a general company identification (for example, the identification of the private branch exchange).

In the case of the use of branch exchange terminals, control software of the public switching office of the home terminal recognizes the call number internal to the branch exchange and automatically sets up a connection to the private branch exchange, the information data being modified once. As a result of this, it is not apparent even for a telecommunications terminal inside the private branch exchange whether the teleworker is located at a company workstation or at his home workstation.

In accordance with another advantageous embodiment, the call deflection can be activated in a simple way from the home workstation, specifically by setting up a telecommunications connection to the public switching office of the line identifications made available, and transmitting a suitable control signal, for example by inputting a special code and/or a PIN number. A line identification that is still free is then automatically

In accordance with a further aspect of the invention, there is a system with the aid of which such a diverting method can be carried out. The essential

components of the system are a plurality of provided line identifications that are managed by a switching office connected to them. This switching office then includes a device for storing the required information that says whether and to which telecommunications terminal a telecommunications connection directed to one of the provided line identifications is to be diverted. Also provided in the switching office are the means required for diverting telecommunications connections such that the device carry out the diversion automatically if necessary.

#### BRIEF DESCRIPTION OF THE DRAWINGS

The invention is to be explained in more detail below with the aid of the attached drawings in which:

Figure 1 shows a diagram of the telecommunications terminals and switching offices participating in the method according to the invention.

Figure 2 shows the diversion of telecommunications connections directed to a company line identification to the home workstation.

Figure 3 shows the design of telecommunications connections from the home workstation.

Figure 4 shows the response of the home terminal in the case of private and of business telephone calls.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

The method according to the invention is preferably implemented by Central Office Exchange Service (CENTREX). This is a service packet in the public network that provides means for constructing a corporate network with branch exchange functions. Centrex provides the possibility of combining the first line identification A<sub>1</sub>, obtained when making a request with the second telecommunications terminal A<sub>2</sub>, that is to say with the home terminal, logically in a network-



wide "Centrex group". Of course, the invention is not limited to Centrex, and may be implemented in any way recognized in the art.

In the example illustrated in figure 1, the line identifications of the company are a component of a private branch exchange PBX. Of these line identifications, the identifications  $A1_1$  to  $A1_N$  are provided for the diverting method, and the two other terminals  $A4$ ,  $A5$  are used, by contrast, for company workstations. As already mentioned, no real terminals need to exist in relation to the identifications  $A1_1$  to  $A1_N$  provided for the diverting method, they can just as well be "virtual" - at least in the case of a part thereof. The connection of this private branch exchange PBX to the telecommunications network  $N$  is performed via the public switching office  $VST1$  of the private branch exchange PBX. This public switching office  $VST1$  includes a storage device, denoted below as teleworker list  $L1$ , that permits rapid access to the data of the line identifications  $A1_1$  to  $A1_N$ . For each individual line identification, these data comprise at least the information as to whether this has already been allocated and to which terminal a connection is to be forwarded. Furthermore, it would also be possible to store a list of the persons that are authorized to participate in the diverting method, together with their access codes.

If one of the line identifications  $A1_1$  to  $A1_N$  is allocated, the associated information is also stored in a second teleworker list  $L2$  that is a component of the public switching office  $VST2$  of the corresponding home terminal  $A2$ .

A call deflection is activated by the teleworker inputting the prescribed access code from his home terminal  $A2$  and subsequently inputting a personal PIN number for his identification. This is recognized by the switching office  $VST1$  of the private branch

exchange PBX, and a free line identification (the line identification  $A1_1$  in the present example), is assigned to the home terminal  $A2$ , and the information is forwarded to the switching office VST2 of the home terminal  $A2$ . The call deflection can also be deactivated again in the same way. There is then the possibility, for example, of detecting the times of logging on and off, and thus also the working time of the teleworker. As already mentioned at the beginning, it can also be provided that some persons are preferably dealt with when requesting the diverting method, and carry out "prioritize login" (for example by inputting a special code). It can then be established that these persons are allocated a line identification in any case, it being possible in the extreme case to allocate an already occupied identification for this purpose.

Figure 2 shows the diversion according to the invention of telecommunications connections directed to the line identification  $A1_1$ . If, for example, a customer dials the number of the line identification  $A1_1$  on his external terminal  $A3$ , the connection is firstly set up as far as the public switching office VST1 of the private branch exchange PBX. On the basis of the information stored in the teleworker list  $L1$ , however, it is recognized in the public switching office VST1 that the call is to be deflected to the telecommunications terminal  $A2$ . The telecommunications connection is then diverted directly from there such that the lines between the public switching office VST1 and the private branch exchange PBX of the company are not loaded. Furthermore, this diversion is not visible to the telecommunications terminal  $A3$ , and so from his point of view the customer is calling the teleworker at a company workstation  $A1_1$ .

If the line identification  $A1_1$  is called from the terminal  $A4$ , which is likewise integrated in the private branch exchange PBX, it is normally sufficient

in private branch exchanges to dial an abbreviated direct dial number. Consequently, in order to permit a diversion to the home terminal A2 here, as well, at least the information as to whether a connection directed to the line identification A1<sub>1</sub> is to be diverted or not is stored in the private branch exchange PBX. When a request is made for call deflection, the corresponding information can be transmitted from the switching office VST1 to the private branch exchange PBX by means of QSIG (Q- (Reference Point) Signaling). If a deflection is desired, the connection is simply forwarded to the public switching office. Once again, a telecommunications connection directed to the line identification A1<sub>1</sub> is then recognized in the public switching office VST1 and is then diverted to the home terminal A2 in accordance with the stored information in the teleworker list L1. Here, as well, the deflection is not visible to the caller. Moreover, there also continues to be the possibility, of course, of reaching the teleworker at his home workstation A2 through his usual private number.

In the case of a diverted telecommunications connection, the calling subscriber is thus subject to charges for setting up the connection as far as the public switching office VST1, whereas the remainder of the communications link is charged to the teleworker (or the company thereof). It is also possible to select from the terminal A3 a line identification - for example, the identification A1<sub>N</sub> - that is a "virtual" terminal which is, however, not even allocated at this instant. In this case, this connection can be forwarded to a mailbox M, to a general company terminal or to the central terminal of the private branch exchange PBX.

Figure 3 illustrates the setting up of telecommunications connections originating from the home terminal A2 of the teleworker. If the latter dials the number of the terminal A3 (for example of a

customer), the telecommunications connection is set up in a known way via the public switching office VST2 of the home terminal A2 and the telecommunications network N to the external terminal A3. In addition, however, on the basis of the information stored in the teleworker list L2 of the public switching office VST2, the information data transmitted in parallel is now modified. If the customer at the terminal A3 is capable of identifying the interlocuter on the basis of the information data, it is not the number of the home terminal A2, but the number of the line identification A1<sub>1</sub> obtained when the request was made that appears in his display. From the point of view of the terminal A3, it is the company terminal with the identification A1<sub>1</sub> that is the origin of the telecommunications connection. This prevents the customer from finding out the private number of the teleworker and possibly calling up the latter during his leisure time. Since, however, a teleworker can be allocated various line identifications in the case of repeated requests, it can be established alternatively that the modified information data display the general number of the private branch exchange PBX or a central company number but not the concrete identification A1<sub>1</sub>.

If the teleworker would like to call from his home terminal A2 to a colleague at the latter's company workstation A4, it is also sufficient at his home terminal A2 to dial the direct call number internal to the branch exchange. This is recognized by the public switching office VST2, and the telecommunications connection is forwarded automatically via the public switching office VST1 to the private branch exchange PBX, and from there to the extension A4.

If the line identifications are made available inside a private branch exchange, it is necessary for exchange of data and information to be possible between the private branch exchange and the public switching office if the call deflection is to be performed as early as

there. Consequently, the line identifications  $A1_1$  to  $A1_N$  made available are preferably respectively main lines that can be managed entirely by the public switching office.

The invention also provides for the teleworker to be able to conduct private conversations from his home terminal  $A2$  even after requesting call deflection. In this case, he firstly dials a special control code in order to suppress the modification of the information data temporarily for a call, and subsequently dials the desired call number. The private number of the terminal  $A2$  and not the line identification  $A1_1$  then appears at the called terminal.

The response of the home terminal  $A2$  and of the public switching office  $VST2$  are illustrated once again schematically in figure 4. If the call deflection is not activated (up), the terminal  $A2$  responds like a normal private telephone connection with the private subscriber profile  $TP1$ . This subscriber profile  $TP1$  reports, for example, under which call number the terminal  $A2$  can be reached, and whether the latter is availing itself of any sorts of additional services (call waiting, mailbox etc).

If the teleworker logs on for call deflection, the terminal  $A2$  additionally receives the teleworker profile  $TP2$ . How the terminal  $A2$  then actually responds depends on the incoming and outgoing telecommunications connections. If the connection that is directed to the line identification  $A1_1$  but is diverted arrives at the terminal  $A2$ , or if the teleworker dials a number after logging on for call deflection, the terminal  $A2$  responds in accordance with the teleworker profile  $TP2$  like the company line identification  $A1_1$ . In the case of incoming connections that come about through dialing of the private number or through inputting of the previously mentioned control code, the terminal  $A2$  responds, however, like the usual residence telephone

in accordance with the normal subscriber profile TP1.

In accordance with a first embodiment, the teleworkers are entitled to participate in the diverting method from their home terminal A2. In this case, the identifications of the authorized home terminals can already be stored in the public switching office VST1 of the private branch exchange. However, it can be provided for reasons of flexibility that also the second terminal to which a telecommunications connection is to be diverted, is not determined until a request is being made. This can be performed, for example, by the teleworker dialing from the terminal to which the connections are to be diverted a special control code for activating the call deflection, subsequently dialing the number of the desired second terminal (which could also, however, possibly be recognized automatically), and dialing a personal PIN number for his identification. Then, for example, the information as to which persons are entitled to avail themselves of the diverting service would initially be stored in the teleworker list L1. During logon, the information can then be supplemented and a new entry be made to the switching office of the second terminal. It is therefore possible to switch into the system from an arbitrary public terminal. Furthermore, it would then also be possible to deflect the calls to a cell phone (for example a GSM phone).

Since the method according to the invention can be realized merely by supplementing the switching office technology, independence from the locations of the terminals is achieved. A change in location requires only a new entry in the teleworker lists, that is to say a low administrative outlay.